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# In Sick, Crowded Ponderosa Forests of West, Seeds of Infernos Lie Ominously in Wait

By GEORGE JOHNSON

Gripping the handles of his steel auger, District Ranger John Peterson twisted the sharp corkscrew tip into the core of a tiny Ponderosa pine, barely three inches in diameter. Extracting a thin, cylindrical cross section of wood from the scraggly tree, which looked as though it must be an infant, he squinted to count the tiny rings, so slight and closely packed that they were barely discernible.

"This tree is so unhealthy," he said. "It's about 60 to 80 years old. It should already be 10 or 12 inches thick."

Mr. Peterson, who was trained as a wildlife biologist, is in charge of the Jemez District of the Santa Fe National Forest in New Mexico, where the Dome fire -- which began April 24, roaring through more than 16,000 acres in and around Bandelier National Monument -- is still smoldering. It is no coincidence that this devastating firestorm occurred in these densely wooded mountains, where Mr. Peterson and his rangers are overseeing more than 100,000 acres of sick pines.

Forestry experts believe the seeds of these conflagrations have been laid over many years. By removing the grasses that compete with pine seedlings, grazing has caused many pines to sprout into dense but ill-nourished thickets, which are tinder for fierce fires. And fire suppression, by interfering with nature's cycle of burning and renewal, has created a buildup of combustible material; the fire that inevitably catches is all the fiercer.

"Everywhere you look in this forest, you see problems," Mr. Peterson said. All around him were thousands of dwarf Ponderosas -- doghair thickets, foresters disdainfully call them -- crammed so closely together that they can barely draw the nutrients and moisture they need to survive. The cramped victims of this arboreal population explosion are easy marks for infestations of pine beetles and parasites like mistletoe, which further sap a tree's strength. And, worst of all, they are sitting ducks for a new breed of unnaturally volatile conflagrations, like the Dome fire, which exploded into the crowns of 300-year-old trees, leaving thousands of acres denuded.

Throughout the Western United States, Ponderosa forests, which stretch from northern Mexico to southern Canada, have undergone a dangerous transition. Where there once might have been 30

to 80 tall Ponderosas per acre -- sometimes even fewer -- there are now hundreds and often thousands. When fire strikes, as it has in recent weeks throughout the drought-parched Southwest, the result is no longer the mild cleansing fires that once nipped at the base of the Ponderosas, clearing out the underbrush and weeding out the weaker trees. The Dome fire burned so intensely that on one five-square-mile hillside, called St. Peter's Dome, every tree was incinerated. All that was left was an expanse of unearthly ash with the black skeletons of Ponderosas sticking up -- as crowded together as the living stand where Mr. Peterson was counting tree rings.

A series of biological studies over the last decade has awakened foresters to the problem, which extends throughout the West. Beginning in the 1880's with the coming of the railroad, the large-scale grazing of millions of cattle and sheep removed much of the grass that carried along the healthy fires -- and that competed with the pine seedlings. Grazing, followed by the United States Forest Service's decadeslong policy of putting out forest fires, has let the Ponderosa pines get the upper hand. Where grass once extended right up to the tree trunks, there is now a thick carpet of explosive pine needles -- the bottom rung of a fire ladder that sweeps flames upward instead of outward, climbing up the doghair midgets right to the tops of the towering Ponderosa pines.

"If you wanted to design a way to destroy Ponderosa forests, you couldn't come up with a better plan," said Dr. Wallace Covington, a professor at Northern Arizona University's School of Forestry. "Of course, none of it was intentional."

The Forest Service now says it has got religion on the issue of fire suppression, and it is using the recent fires to drive home its new credo: the woods need to be cleared with widespread, carefully controlled burns. "It's like somebody turned on a light," Mr. Peterson said. Where the Forest Service used to burn a few hundred acres at a time, it is now burning thousands. "As efficient as we've been in putting out fires, we've caused a big problem," he said.

Prescribed burns are not without risk. There is always the danger that one will get out of hand, as happened in 1993 in the Jemez District, killing a firefighter. And some planned fires can have the opposite of the effect intended, sparing the doghair thickets and killing the old-growth Ponderosas the foresters want to save.

To piece together the way forests and forest fires used to behave, Dr. Thomas Swetnam, a professor at the University of Arizona's Laboratory of Tree Ring Research, has spent a decade studying Ponderosa pines in the Jemez, where his father was once district ranger, and in sites throughout New Mexico and Arizona. Examining scars in the tree rings, Dr. Swetnam found that fires -- presumably set by lightning -- generally swept through the Southwestern mountain ranges every 3 to 10 years until about 1890 to 1910. In 1748, for example, 41 of the 63 sites he studied were struck by fire. "If you were in the Southwest in 1748, it would be extremely smoky," Dr. Swetnam said.

But the fire seasons did not occur at random. They were driven by the engine of climatic change. By comparing the smoke scar records with tree ring data gathered by University of Arizona

scientists, Dr. Swetnam and Dr. Julio Betancourt of the United States Geological Survey in Tucson found that the fiery years coincided with years when droughts followed several seasons of rains. The lesson was this: dry years like 1996, when fires sweep the Southwest, are perfectly normal. It is the intensity of the flames that is new.

Some effects of overcrowding are more subtle, though no less worrisome to ecologists. Studies have shown that chemicals called terpenes in the pine needles -- that is what gives them their piney smell -- interfere with bacteria that convert nitrogen in dead wood into a form that plants can use. The thick carpet of pine needles also traps rainwater -- which is already being retarded by the continuous canopy of forest -- keeping it from penetrating into the ground. What little trickles down must find its way through the increasingly thick network of tree roots.

"In a very real sense, we are seeing the desertification of pine forests," Dr. Covington said. All over the Southwest, springs are slowly running drier, he said.

The Forest Service embraces these studies as testimony that it needs to carry out more therapeutic burns. But Dr. Covington's research shows that the answer may not be so simple. At Chimney Spring, near Flagstaff, Ariz., he and other researchers have been burning two-and-a-half-acre plots at intervals ranging from one to eight years. After five or six years, the scientists were perplexed to find that old-growth Ponderosas were dying while younger, unwanted trees were being spared. Ten years into the project, 70 percent of the old Ponderosas were dead.

Using temperature probes buried beneath the soil, scientists found the answer. There were so many more pine needles, pinecones, bark and other debris beneath the Ponderosas that the fire burned much hotter there, cooking the roots. These and other studies have led Dr. Covington to conclude that prescribed burning must be preceded by mechanical clearing -- raking debris and thinning out stunted trees.

But treating millions of acres of Ponderosa forests would require a public works project of huge proportions. "The public might not stand for it," Mr. Peterson, the Jemez ranger, said. "People believe this is what forests are supposed to look like."

Environmentalists become suspicious when the Forest Service starts planning more large-scale operations in the public woodlands. Kieran Suckling, executive director of the Southwest Center for Biological Diversity in Tucson, said the Forest Service was trying to divert attention from the major cause of the sick forests: logging and the removal of the fire-carrying grasses by cattle grazing. "The primary cause of fire suppression is not the guys in yellow jackets, it's the cows," he said. But many ecologists doubt that grazing is as big a problem as it used to be.

Mr. Suckling also says the Forest Service bolsters its cause by selectively quoting from historical records, in which early explorers describe the Ponderosa forests as "open and parklike." To counter this impression, he has unearthed old reports that speak of dark forests "black with heavy timber." But historical accounts are notoriously subjective. In higher elevations, dense forests with a mix of pines, firs and spruces have always been the norm, biologists say, and occasional crown

fires in these regions are actually considered natural.

Scientists are reminded that even today's wildfires are not all bad. When flames sweeping down from St. Peter's Dome and surrounding mountains hit sparser pinon-juniper forests on the Bandelier monument's lower mesa tops, the flames slowed and cooled into the healthier fires ecologists like to see.

But it is only a matter of time before the pinon-juniper forests become as crowded and volatile as the stands of Ponderosas above them, Dr. Covington said. The same factors -- fire suppression and grazing -- are causing the density of these trees to increase. "Fifty years from now we will see crown fires of biblical proportions," he said.

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